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ABSTRACT

The number of educational sites on the World Wide Web grows daily and teachers may have difficulty identifying sites that are well matched to their intended outcomes for learners. This study describes the development of an instrument to categorize educational Web sites. One hundred ninety-five "exemplary" or award-winning educational Web sites were examined and evaluated by the researchers. During the evaluation, 13 general site categories emerged, and the sites were sorted into these categories: instructional; content collection; archive/database/reference; compilation of individual online learning activities/games; collective of links; online exhibit; teacher resource; vicarious participation; research/curriculum project; communication community; places with public mission; academic or research organization; and commercial. This paper describes the categories of the instrument, the process by which the instrument was developed, and the result of this categorization. (Author/AEF)

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TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

Categorizing Exemplary Educational Websites

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Abstract

The number of educational sites on the World Wide Web grows daily and teachers may have difficulty identifying sites well matched to their intended outcomes for learners. This study describes the development of an instrument to categorize educational Websites. One hundred ninety-five (195) "exemplary" or award-winning educational Websites were examined and evaluated by the researchers. During the evaluation, thirteen general site categories emerged, and the sites were sorted into these categories. This paper describes the categories of the instrument, the process by which the instrument was developed, and the result of this categorization.

The use of the World Wide Web (the Web) appears to be increasing rapidly in education, and may have already become an important resource for teaching and learning. However, the sheer number of educational sites and variety of sources can be overwhelming for educators who want to incorporate the Web in instruction. It is difficult to know which sites are good and which are not. In fact, this proliferation and the speed with which new sites appear makes it near impossible for any one teacher to examine enough sites to sift the wheat from the chaff.

To assist teachers and parents, some organizations and agencies have recognized educational sites they judge to be "exemplary." For example, the International Academy of Digital Arts and Sciences selects the best of the Web for the annual Webby Awards (http://www.webbyawards.com/nominees/index.html). Similarly, each year the Education Source names their Top 100 Educational Websites (http://www.edusource.com/articles/top100_99/default.asp). PC Magazine also names its annual Top 100 Websites, including an "Education and Family" category (http://www.zdnet.com/pcmag/stories/reviews/0,6755,2394453,00.html). Some agencies identify "exemplary" Websites more often; for example, each month the Eisenhower National Clearinghouse for Mathematics and Science Education (ENC) recognizes thirteen exemplary Websites in science and mathematics (http://www.enc.org/classroom/dd/nf_ddcrit.htm).

Examining these recognized educational Websites reveals a wide variety of purposes, strategies, audiences, and content. Our purpose in this study was to examine such recognized educational Websites and develop an instrument to categorize them based on emergent categories. This, in turn, should help show which types of sites seem most likely to be named as "exemplary."

Methods

A total of 218 sites were compiled from sites recognized in 2000 by the above-named recognizing groups (Webby's, ENC, Top 100 Ed Websites, PC Magazine). When we examined those sites, seven were duplicates and sixteen were non-functional, yielding 195 functional "exemplary" educational sites.

The 195 sites examined were developed for various purposes and were diverse in target audience and content. This meant that any instrument we designed had to encompass what we found on the sites. Beginning with a proposed categorization instrument, two researchers reviewed and categorized each of the 195 sites. They then compared results, and discussed and debated at length on sites they categorized. A third researcher served as a mediator to resolve inter-rater differences. Each site was analyzed until all three members agreed on the categorization of every site. The instrument and operational definition of each category evolved during the process of evaluating the sites. That is, as we analyzed the sites and resolved our disagreements, the categories on our instrument were modified or confirmed.

Below we list 13 possible categories for Websites that emerged as the researchers evaluated the sample of "exemplary" or award-winning sites. Note, however, that not all sites can easily be placed in a single category. Some sites exhibit properties of two or more of the following categories. When classifying these sites, we identified which classification seemed most representative of the site as a whole. Sites that were equally distributed across two

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or more types were noted and included in the discussion of results. The categories are presented as follows with definitions and examples of each

Instructional

To be classified as instructional, a site must include (1) an intended learning outcome, (2) instructional strategies, (3) learning materials and activities, and may include (4) learner assessment and/or feedback. An instructional strategy is a pedagogical technique designed to facilitate learning through a combination of teacher and learner activity. We observed that these elements may be explicitly stated and demonstrated or they may be embedded within site content.

Instructional Websites with a constructivist-oriented design and/or self-exploratory navigation strategy usually don't include formal stated learning tasks, however. Instead, these sites usually provide learning activities that require learners to do something on the Web, including reading posted information; completing practice activities and/or playing games; exploring related resources; using a site search engine; communicating and/or sharing with peers, teachers, and/or experts; exploring, articulating, or reflecting in a problem-based learning; and creating content. Note that the learning activities in a site must go beyond just reading posted information in order to be categorized as an instructional site.

Examples of instructional sites include: *Learn Physics Today* (http://library.advanced.org/10796) and *Conflict Yellowstone Wolves* (http://powayusd.sdcoe.k12.ca.us/mtr/ConflictYellowstoneWolf.htm). *Learn Physics Today* is an online physics tutorial. *Conflict Yellowstone Wolves* require learners to analyze the Rocky Mountain Gray Wolf problem and draw their own conclusion to the question: Should the wolves in Yellowstone National Park be removed?

Sometimes a site will appear to be instructional when it is not. For example, some sites provide online quizzes and games (one form of learning activity). However, their mere presence does not guarantee that a site is instructional. When quizzes and games serve no instructional purpose and are designed primarily for entertainment, we did not classify the site as instructional. Another way in which a site can erroneously appear to be instructional is when it uses instructional labels like "tutorial" or "problem-based learning project" in referring to itself, but actually contains no instructional strategies. In other words, it is not enough simply to claim to be instructional. The key is whether the site includes the three essential instructional elements.

Content Collection

A content collection site is a collection of information about a specific content area (such as genetics or insects) that is informative and might be used in learning but is not instructional. Content collection sites differ from instructional sites in that they don't provide users with learning activities, goals, strategies, or assessment. They may, however, include informative readings, illustrations and other rich content. A typical content collection site on a specific subject is *Common Cold* (http://www.commoncold.org/), a comprehensive source of information about the common cold. *Carol Hurst's Children's Literature Site* (http://www.carolhurst.com/) is an example of content collection site on a general topic. The site is a collection of reviews of great books for kids, ideas of ways to use them in the classroom and collections of books and activities about particular subjects, curricular areas, and professional topics.

Archive/Database/Reference

An Archive/Database/Reference (ADR) is a collection of information that is organized as an archive. These sites may be indexed chronologically, alphabetically, or topically. Such sites are designed as information and reference tools. Online dictionaries, encyclopedias, reference books, and question-answer services comprise this category. These differ from Content Collections in that they may address multiple topics and are oriented toward searching for information rather than examining a topic. One example of an ADR sites is *American Memory* (http://memory.loc.gov), a site that offers more than seven million digital items from more than 100 historical collections relating to the history and culture of the United States. *Ask Jeeves for Kids* (http://www.ajkids.com/) and *The Last Word Science Questions and Answers* (http://www.last-word.com/) are representative of questions-answers service ADR sites.

Compilation of Online Learning Activities/Games

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These sites are collections of individual learning activities and/or games to be completed online by learners. *ExploreMath.com* (http://www.exploremath.com/index.cfm) is a collection of interactive math activities in 13 categories. As suggested by the site, these individual learning activities may be incorporated into the mathematics classroom, lab, or distance learning curricula, but such compilations fail to exhibit the essential three components of an instructional site.

Collection of Links

Sites in this category feature listings of categorized external hyperlinks to online resources on a subject. They contain little or no content of their own and serve principally as portals to external content. European Renaissance (http://www.execpc.com/~dboals/rena.html) lists 67 related external links. It should be noted that if a site's collection of links are mostly internal (or most of the actual content is within the site), it should be classified as Content Collection.

Online Exhibit

Online exhibits are focused collections of media (for example, images, recordings, animations, videos, VRMLs) related to some particular content or event. Displays of museum or organization holdings online are typical of this category. Such sites are designed for exhibition and information purposes. These virtual exhibits are often representations of actual museum exhibits in the physical world. For example, *Ocean Planet* (http://seawifs.gsfc.nasa.gov/ocean_planet.htm) is an online version of than actual exhibit from the Smithsonian National Museum of Natural History.

Teacher Resource

Teacher resource sites are designed to provide teachers with such things as lesson plans, classroom activities, teacher guides, curricula, state and national standards, and professional-development resources. These materials may be housed within the site or available as downloadable files. While such sites may also include subject matter links and learner activities, the main focus of the site is assisting teachers.

For example, *One Sky Many Voices* (http://www.onesky.umich.edu/) lists inquiry-based K-12 science curricula for use by teachers, and *Illuminations* (http://illuminations.nctm.org/) is designed as a teacher resource with the following components: online multimedia math investigations, classroom video vignettes, standards-based lesson plans, links to reviewed Websites, and access to the National Council of Teachers of Mathematics Principles and Standards.

Vicarious Participation

Vicarious participation sites provide learners with opportunities to participate online in an ongoing educational or research activity, or an expedition. Virtual field trips are included in this classification. These sites attempt to give the learner a sense of participation in activities not available to the typical classroom student. Such sites may archive the materials from past explorations for examination any time after the activity is concluded. *The Jason Project* (http://www.jasonproject.org/) is an examp le of an ongoing educational activity. In *The Jason Project*, learners can participate in a current learning adventure and visit Jason's past expeditions. In *Extreme 2000* (http://www.ocean.udel.edu/deepsea/), a deep-sea research expedition, learners may view video clips of the expedition, read the dive log and daily journal, and listen to live audio from the research team.

Research/Curriculum Project

These sites are designed to inform the visitor about a particular ongoing research or curriculum project. Content may include news and upcoming events, research results and publications, individuals associated with the project, funding, and other related information. For example, Rural and Urban Images (http://www.ael.org/nsf/voices/index.htm) is a three-year project seeking to help girls excel and feel confident in science, math, and technology.

Communication Community

Communication community sites facilitate discussion, interaction, entertainment, and other information-sharing. Users can play interactive games and share thoughts and ideas with each other via e-mail, chat, and message boards. Such sites usually do not include learning activities, although they may be "educational" in the broader sense of encouraging discussion of current events and issues of importance to learners. Example sites include *Cyberkids* (http://www.cyberkids.com/) and *Kids Space* (http://www.kids-space.org/).

Place with Public Mission

This Website classification refers to actual places such as museums, historic sites (like Mystic Seaport or Colonial Williamsburg), zoos, gardens, aquariums, parks, and the like. Such sites typically address visitor information, schedules, exhibits, "how to get here," membership, and special events. Many of these sites include an education section with learning materials and activities for teachers and students and are often referred to under the umbrella of Informal Education. *Exploratorium* (http://www.exploratorium.edu/index.html) and *Colonial Williamsburg* (http://www.history.org) are two examples of such sites.

Academic or Research Organization

These sites represent a particular non-commercial research organization or academic unit. They typically address such things as the nature and purpose of the organization, purpose, its current and past projects, recent results, pertinent news and events, and related educational materials and activities. *NASA* (http://www.nasa.gov/) and the *NASA Jet Propulsion Laboratory* (http://www.jpl.nasa.gov) are two examples of such sites.

Commercial

Commercial sites are primarily intended to promote and sell products or services. Many commercial sites have ancillary components designed to inform, educate, or entertain. For example, a company selling cold and flu medicine may include information or instruction about the causes and treatments of colds and flu. It is sometimes necessary to explore a site extensively to identify whether it is commercial or not. Simply having commercial sponsorship (as might be indicated by advertising banners) is not enough. The site must have a goal of helping to promote a company's products. One way in which some commercial sites promote their products or services subtly is by targeting young audiences using cartoon-like animation and games on their Websites. Once again, one needs to look for the commercial connection. Usually it becomes clear on close examination. Examples include *CNN Interactive* (http://www.cnn.com), *National Geographic Society* (http://www.nationalgeographic.com/), *SurfMonkey Kids Channel* (http://www.surfmonkey.com/) and *US Space Camp* (http://www.spacecamp.com).

Table 1 presents the distribution of "exemplary" sites across our classification scheme. The three categories most likely to be recognized, in order of distribution in our study, were Content Collection (26.2%), Instructional (20.5%), and Teacher Resource (11.8%). These three types of sites account for approximately six out of every ten sites recognized. This suggests how the recognizing groups defined "exemplary" and perhaps hints more directly at how they viewed educational use of the Web.

Table 1. Distribution of "Exemplary" Educational Websites Across Categories

Categories	**# of Sites**	**%**
Instructional	40	20.5%
Content collection	51	26.2%
Archive/Database/Reference	14	7.2%
Compilation of individual online learning activities/games	13	6.2%
Collection of links	13	6.2%
Online exhibit	7	3.6%
Teacher resource	23	11.8%
Vicarious participation	9	4.6%
Research/Curriculum project	2	1.0%
Communication community	2	1.0%
Places with public mission	11	5.6%
Academic or research organization	6	3.1%
Commercial	10	5.1%
Total:	195	100%

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Conclusions

We learned quickly that some sites cannot be neatly classified into a single category. We analyzed sites that could be assigned to two, three, or more categories. In dealing with such sites, we chose to make a holistic assignment based on what we deemed to be the site's principal orientation in terms of our classification scheme. For example, *NASA Is My Playground* (http://kids.msfc.nasa.gov/) and *Merriam-Webster Word Central* (http://www.wordcentral.com) contain both instruction and teacher resources. Since the majority of content was instruction, the sites were categorized as instructional sites. *Ask Jeeves for Kids* (http://www.ajkids.com) fits into at least three categories -- ADR, Teacher Resource, and Communication Community. Since its primary activity was searching, it was classified as an ADR site.

Although Reeves and Reeves (1998) and Wilson (1997) have suggested that constructivist design may be promising in Web-based learning environment, the "exemplary" sites examined in this study were almost exclusively objectivist in design orientation. Our results are consistent with those in a similar study conducted by Mioduser, Nachmias, Lahav, and Oren in 1998. Their study investigated 436 educational Websites in an effort to determine the current state and emerging trend in Web-based learning environment.

We found a number of Websites that perhaps overstated the extent to which they were instructional sites. For example, *Embryo Images* (http://www.med.unc.edu/embryo_images/) described itself as an instructional tutorial, but is simply is a slide show of images with text descriptions. Other sites included descriptions of "exploration" or "problem-based" instructional strategies, but turned out to involve nothing more than reading posted information.

The next step in our research will be to complete an analysis of the instructional design of the 40 instructional sites we identified. Our goal is to determine the major common characteristics of such recognized instructional Websites. As part of this analysis, we plan to refine and expand our current instrument's categories.

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